

# Redundant modifications of Lichtenstein technique in hernia repair – a descriptive study of practising surgeons in Poland

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## Abstract

**Introduction:** The Lichtenstein tension-free repair has become the standard method for repairing inguinal hernia in many surgical units. Numerous modifications are applied to the original technique. However, some of these alterations draw the method away from the principles of the procedure.

**Aim:** To estimate the current state of practice of surgeons in Poland regarding various methods of mesh fixation in Lichtenstein hernia repair.

**Material and methods:** An analysis was performed on the internet questionnaire's replies of a randomly selected group of 242 Polish surgeons. The survey included 28 questions. One hundred sixteen surgeons responded (response rate 48%). A total of 111 replies were found to be suitable for analysis.

**Results:** Only 3% of respondents use only precut prostheses. Among the remaining group, surgeons reported discrepancies regarding shape of the medial corners of the mesh, size of the tails and the presence of the opening for the spermatic cord. The respondents were divided about the materials used for mesh fixation, suturing mode (continuous or interrupted) and number of passes of the suture. The surgeons indicated various techniques of mesh positioning concerning relation to the pubic bone, fixing the tails and the amount of mesh laxity.

**Conclusions:** The results demonstrate frequent appliance of various modifications. The use of some of these alterations is unreasonable and should be abandoned. Therefore, following the key guidelines of the Lichtenstein tension-free hernioplasty assures achieving the best results.

**Key words:** Lichtenstein, inguinal hernia repair, modifications.

## Introduction

Almost a quarter of a century after the introduction of the Lichtenstein technique in hernia repair in 1984, the operation has been comprehensively evaluated in numerous studies and has been universally accepted [1]. Therefore, it is considered the gold standard of hernia repairs [1, 2].

There is a disparity between the complication rate after the Lichtenstein repair reported by different cen-

tres [3, 4]. Based on mistakes made, in the late 1980s, Amid presented the principles of the procedure in 1993 and recently described the essential guidelines that may play a role in the origin of recurrences or chronic pain [1, 5]. Thus, key principles of the operation have been formulated [1, 6, 7]:

1) the mesh is to be extended approximately 2 cm beyond the pubic tubercle to overlap the pubic bone, 3 cm above Hesselbach's triangle and 5 cm lateral to the internal ring;

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2) the tails of the mesh behind the spermatic cord should be crossed with both lower edges of each tail fixed to the inguinal ligament;

3) the mesh should be secured with two interrupted sutures on the upper edge and one continuous suture with no more than 3 to 4 passes on the lower edge;

4) the prosthesis should be fixed in a slightly relaxed dome shape configuration;

5) the regional nerves (iliohypogastric, ilioinguinal and genital) should be identified and protected throughout the operation.

### Aim

The objective of the study was to estimate the current state of practice of surgeons in Poland regarding various methods of mesh fixation in Lichtenstein hernia repair with respect to the technical aspects described by Amid.

### Material and methods

An analysis was performed based on the internet questionnaire's replies of a randomly selected group of 242 Polish surgeons. A questionnaire form was mailed both to experienced surgeons and surgical residents. The survey included 28 questions. One hundred sixteen surgeons responded (response rate 48%). Five incomplete responses were rejected from further study. As a result a total of 111 replies were found to be suitable for analysis. Answers were obtained from 51 surgical departments out of 47 localities.

The analyzed group consisted of surgeons experienced in inguinal hernia repair. Three out of four respondents stated that they had over 5 years' experience in hernia surgery. More than half of the doctors (53%) have performed hernioplasties for over 10 years. The Lichtenstein technique has been used in hernia surgery for over 5 years by 57% of respondents (Figure 1). Of all, only 6% have applied this method for less than 2 years. Seventy-two percent of surgeons carry out approximately 2-4 inguinal hernia repairs per month. One out of four surgeons conducts more than two hernioplasties weekly (Figure 2). The Lichtenstein technique is the primary procedure for more than a half of respondents (53%). Of all the surgeons, only 22% employ this method in less than 20% of all inguinal hernia repairs.

### Results

The detailed questions regarding Lichtenstein hernia repair were divided into four major groups including shape of the mesh, its localization, fixing method and nerve preserving practice. Seventy one percent of the surgeons always achieve the proper shape of the mesh individually intra-operatively. Only 3% of the respondents permanently employ precut prostheses, while 26% use both ways. The tails of the mesh are formed into two equal width strips by 28% of the surgeons. Sixty six percent of the respondents make a slit in the mesh, maintaining the relation between the upper and lower tail as 2 : 1.

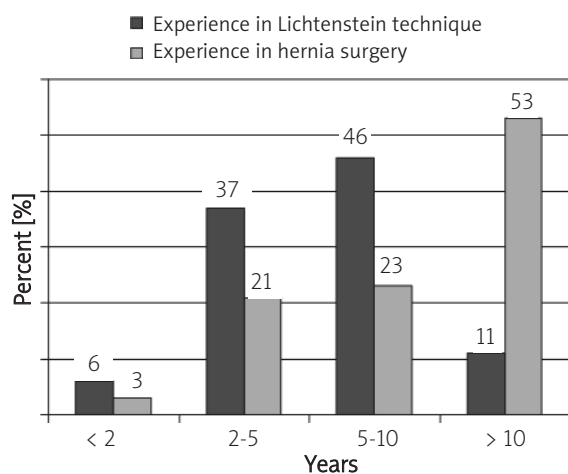


Figure 1. Respondents' experience in hernia surgery and in Lichtenstein technique

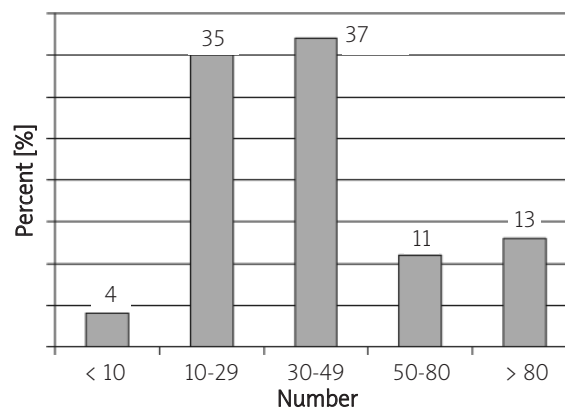


Figure 2. The number of performed Lichtenstein hernia repairs annually

The rest of them employ a more distinctive configuration. The length of the tails is shorter than 3 cm in the daily practice of 27% of the surgeons, while only 3% of them routinely exceed the distance over 5 cm. The corners of the medial margin of the prosthesis are rounded identically by 41% of the respondents, while 43% of them form a foot-like shape with the upper corner rounded to a greater degree than the lower one. The opening for the spermatic cord is cut out by 51% of the respondents. The size of the aperture is tailored individually according to the patient’s anatomical configuration by 67% of the surgeons; 21% routinely apply a diameter over 1 cm; 12% apply less than 1 cm.

The lower margin of the mesh is sutured to the inguinal ligament with a non-absorbable monofilament by 94% of the surgeons. Of all, 83% attach the lower margin of the mesh with continuous suture, while 17% of them apply interrupted sutures. The number of suture passes on the lower margin of the mesh is presented in Figure 3. The upper margin of the prosthesis is attached to the internal oblique muscle or to the fibres of its aponeurosis with interrupted sutures by 87% of the surgeons; those in the remaining group apply continuous suture. The number of sutures or suture passes on this margin is presented in Figure 4. Of all, 72% attempt to anchor the mesh with sutures tied in an “air-knotting” technique. The lower margin of the upper tail is fastened together with the lower margin of the lower tail to the inguinal ligament by 42% of the surgeons. Fifty three percent of them slightly cross the tails behind the new internal ring. The mesh is fixed flat in place over the posterior wall of the inguinal canal by 66% of the respondents. Thirty percent of them apply

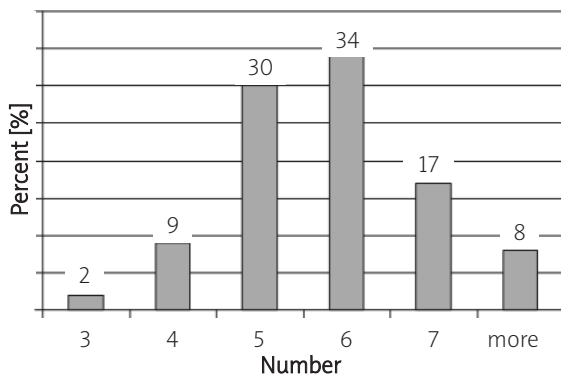
some degree of laxity, and 4% of them fix the mesh under minor tension. The lower medial corner of the prosthesis is positioned over the pubic bone by 92% of the surgeons. The overlapping distance was declared to be less than 1 cm in 49% of replies, whilst in 5% of applications it exceeded 2 cm. The mesh extends for more than 3 cm beyond Hesselbach’s triangle in half of the studied group.

The percentage of respondents that intended to routinely identify and preserve the iliohypogastric and ilioinguinal nerve throughout the operation was 62%. Thirty six percent of them conduct this technique occasionally. The genital branch of the genitofemoral nerve is protected permanently by 41% of respondents, while 43% perform its preservation sporadically.

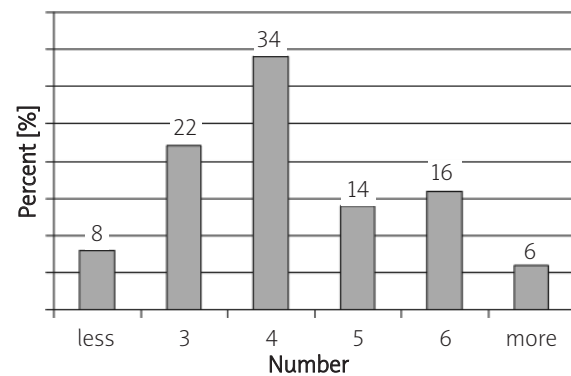
### Discussion

The clearest message of this study is how commonly surgeons employ alterations in the original Lichtenstein hernia repair method. There is a significant discrepancy between the state-of-the-art Lichtenstein technique and its application in general practice with respect to fundamental steps of the original procedure. The results of this questionnaire show that the performance of general surgeons needs improvement.

In the original Lichtenstein technique a slit is made in the mesh in order to obtain two tails of the prosthesis. The upper tail should be twice as wide as the lower one [6, 7]. Such a relation allows a surgeon to perform crossing of the tails, resulting in a dome-like shape of the mesh after reconstructing the internal inguinal ring. Two out of three



**Figure 3.** The number of suture passes on the lower edge of the mesh



**Figure 4.** The number of sutures on the upper edge of the mesh

respondents stated that they employed this technique. At the same time, more than a quarter of the surgeons create identical tails, discarding the possibility of forming a valve-like system over the internal ring. Moreover, Amid repeatedly advised crossing the tails of the mesh, so that the lower margins of both tails are attached to the inguinal ligament lateral to the internal ring [1, 7]. Our data showed that the majority of respondents (53%) while crossing the tails do not accomplish the described extent. Of all surgeons, 5% declared suturing the tails together in a parallel position, which may be the cause of recurrences in the internal inguinal ring area [6, 7].

Half of the surgeons, in order to avoid folding of the mesh around the spermatic cord after crossing the tails, cut out the opening in the prosthesis for the internal ring. Such practice may result in eliminating the valve-like mechanism of the tails and become another cause of recurrences in this area [6].

Lichtenstein's successor, Amid, advised maintaining the length of the tails over 5 cm [1, 7]. In the studied group most of the surgeons declined this recommendation, leaving too short extensions, which may result in increased risk of hernia recurrence.

Bay-Nielsen in 2001 reviewed 87 records from operations for recurrence after a previous Lichtenstein procedure and found direct recurrences in 62% of all cases [8]. The most plausible explanation for the development of direct recurrences is insufficient medial mesh fixation and overlap over the pubic tubercle. Almost 8% of the respondents from our study admitted not paying enough attention to this specific technical aspect of the operation. Among the remaining group there were discrepancies regarding the overlapping distance. Almost half of the surgeons reported positioning the mesh over the pubic tubercle for less than 1 cm. Amid advised extending the mesh approximately 2 cm medial to the pubic tubercle [1, 6]. This recommendation is routinely implemented by only 5% of respondents. Thus, avoidance of the majority of recurrences after the Lichtenstein repair may be obtained by increased attention to this essential principle of the procedure [7].

In some cases the problem in overlapping over the pubic tubercle may be the outcome of attaining the inappropriate shape of the medial margin's corners. The medial margin should reflect the shape of the medial section of the inguinal canal with a slightly rounded lower corner and the upper one

incised in larger curvature, resulting in the shape of the tracing of the foot [6, 7]. Nevertheless, only 43% of the respondents obtain the proper shape of the prosthesis according to the above description. Among the remaining group, some problems may occur in overlapping over the pubic tubercle due to the described inadequacy between the shape of the mesh and the space for it.

With the purpose of reinforcing the posterior wall of the inguinal canal with the mesh it should extend for at least 3-4 cm above Hesselbach's triangle [1, 7]. In our material half of the surgeons employ this recommendation. A wide prosthesis may be stretched up to the fibres of the internal oblique muscle's aponeurosis. Subsequently, the risk of entrapment of the iliohypogastric nerve by the sutures positioned on the upper margin of the mesh is reduced.

Among the key principles of the operation formulated by Amid that may play a role in the origin of chronic pain is fixation of slightly relaxed mesh, which will be under minor tension in the upright body position and will be subject to shrinkage [7]. Approximately only one out of three respondents attempts to acquire some degree of laxity during prosthesis fixation. After operations performed by surgeons from the remaining group some complications related to increased tension of the mesh may occur.

Amid repeatedly advised securing the upper edge of the mesh with two interrupted sutures and the lower edge with one continuous suture with no more than three to four passes [6, 7]. These recommendations are partially implemented in the general practice of Polish surgeons. While most of the respondents apply the appropriate type of suture, there is still a disparity in the number of suture passes. Awareness of the development of recurrences near the pubic tubercle obliges surgeons to excessively increase the number of suture passes as an alternative to precise anchoring of the first suture over the pubic tubercle. An analogical situation occurs regarding the upper margin. Surgeons increase the number of sutures, which may pose a risk of iliohypogastric nerve entrapment [9, 10]. The role of these sutures is to prevent moving and folding of the prosthesis, not sealing it up around.

According to Kalan, the suturing technique for anchoring the mesh plays an important role in postoperative pain after hernia repair [10]. Sutures

placed too tightly are often the site of pain or point tenderness. This type of suturing-technique-related pain can be significantly reduced by an “air-knotting” technique. Three out of four surgeons act according to the described practice.

Alfieri reported that failure to identify the inguinal nerves is significantly correlated with chronic pain, with the incidence of chronic pain increasing with the number of undetected nerves [11]. Our data revealed that the majority of surgeons routinely visualize and protect the ilioinguinal and iliohypogastric nerves. However, the respondents indicated that they intended to identify the genital branch of the genitofemoral nerve less regularly, since visualization of the genital nerve is more complicated.

The need to search for improvements in the Lichtenstein method is also present among surgeons practising in other countries. Recently, a Netherlands survey by Wijsmuller reported that a wide variety of personal interpretations is employed and is being taught [9]. However, it is not clear to what extent widely different interpretations of a standardized technique negatively influence outcome.

As a consequence of the drawbacks of the Lichtenstein technique surgeons are searching for an ideal technique that would combine the benefits of the original technique and would be free from most of the negative aspects resulting especially in the need for its modification. Among new methods developed lately it seems that the innovative technique (PAD) invented by Gabrielle Valenti is close to completely meeting these expectations [12]. The PAD technique excludes the possibility of any additional modifications, because every single step of the procedure is precisely defined. Furthermore, all of the key principles of the Lichtenstein technique are employed in the Valenti method.

The alterations introduced to the original Lichtenstein technique should be reviewed to search for any aspects that may be called an adverse misstep, instead of a constructive modification. Furthermore, it is not obvious whether all of the surgeons entirely realize that the technique they were taught is far from the essential features of the original procedure’s guidelines. The general concept of the method is not the only factor approving us to consider all of its variations as the same practice. Thus, comparing the results

of hernia surgery from various facilities should require employing the same technique with respect to all the detailed technical steps of the procedure.

## Conclusions

The results demonstrate frequent application of various modifications. The use of some of these alterations is unreasonable and should be abandoned. Therefore, following the key principles of the Lichtenstein tension-free hernioplasty assures achieving the best results.

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